Program IV. **STATISTICS**

SOL Topic:

A.4

The student will use matrices to organize and manipulate data, including matrix addition, subtraction, and scalar multiplication. Data will arise from business, industrial, and consumer situations.

Activity 1: **Show matrix data entry, matrix addition, matrix subtraction, and scalar multiplication.**

In the matrix menu enter the following data for a 2 X 2 matrix

$$[A] = \begin{bmatrix} 1 & 5 \\ -8 & -2 \end{bmatrix} \qquad [B] = \begin{bmatrix} -4 & 1 \\ 0 & \frac{1}{2} \end{bmatrix}$$

Return to the home screen and perform the following operations:

- [A] + [B]
- [A] - [B]
- 2 [A]
- 2 [A] - 3 [B]

Activity 2: **Organize data into matrices to find the inventory of 2 shoe stores. Show matrix addition to show total inventory of the shoe store chain such that inventory does not fall below 30 of each size.**

Data for Store Alpha:

Styles	**Sizes**	**Inventory**
Loafers	10	30
	11	70
	12	90
Sneakers	10	120
	11	200
	12	50
Oxfords	10	40
	11	70
	12	33

Data for Store Beta:

Styles	**Sizes**	**Inventory**
Loafers	10	80
	11	10
	12	100
Sneakers	10	200
	11	185
	12	150
Oxfords	10	75
	11	80
	12	106

Sizes

Store Alpha:

	10	11	12
Loafers	30	70	90
Sneakers	120	200	50
Oxfords	40	70	33

Store Beta:

	10	11	12
Loafers	80	10	100
Sneakers	200	185	150
Oxfords	75	80	106

Store [Alpha] + Store [Beta] = [Total Inventory] -> [Gamma]

- Show how to store a matrix
- Show how to "fill" a matrix with the numeral "30" = [Minimum Inventory]

[Total Inventory] - [Minimum Inventory] = [Quantity Sold Prior to Reordering]

SOL Topic

A.17

The student will, given a set of data points, write an equation for a line of best fit, using the median fit method, and use the equation to make predictions.

Activity 3: **<u>CLASSROOM VIDEO</u> of collection of data from "The WAVE"**
Procedure:

- Select the number of persons for each group.
- The first person will stand up, say "START", his first and last name, sit down.
- The last person must say "STOP" after saying his first and last name.
- Record the time in seconds.
- Increase the number of groups with each pass.
- Save data as an ordered pairs (number of people, time).
- Enter the data in lists (L_1 and L_2).
- Graph the data as a scatter plot.
- Estimate a line of best fit with a piece of spaghetti.
- Find the slope of that line.
- Derive an equation and place in "Y_1 ="
- In "Y_2 =" find the line of best fit using Linear Regression "LinReg (ax+b)".
- Compare the two lines.
- Predict how long it would take to "Do the WAVE Twice"

SOL Topic:

A.18

The student will compare multiple one-variable data sets, using statistical techniques that include measures of central tendency, range, stem-and-leaf plots, and box-and-whisker graphs.

Activity 4: ***<u>CLASSROOM VIDEO:</u>*** **The Birthday Problem collecting one-variable data showing, central tendency, range,and a box-and-whisker graph.**

Procedure for Box and Whisker Graphs:
Using a Julian Calendar and the home screen of the calculator students will compute the Julian Calendar Day on which they were born.

- Students will form a line in ascending order using their calendar day.
- Find the middle (Median) of that line.
- Find the Minimum day, Maximum day, compute the Range, the First Quartile, the Third Quartile, and the Mean (a useless quantity)
- Go to "STAT PLOT" (2nd Y=), press ENTER.

- **E**nter the data into the calculator in L_1.
- Turn Plot 1...On, Highlight Box and Whisker, press ENTER, let Xlist : L_1, Freq: 1
- For WINDOW let : Xmin = - 10, Xmax = 400, Ymin = - 3, Ymax = 10, Yscl = 1.
- GRAPH and TRACE find : MinX, Q1, Med, Q3 , MaxX.

Activity 4: <u>CLASSROOM VIDEO:</u> Derive a Histogram and Stem and Leaf Plot from the Birthday Data

Procedure for Histogram:

- Using the "Birthday Program" previously linked into the calculators, students will find the day of the week on which they were born.
- Students will line up in seven lines representing each day of the week.
- Teacher will assign a position number to each student.
- **E**nter the position numbers into the calculator in L_1.
- Turn Plot 1...On, Highlight Histogram, press ENTER, let Xlist : L_1, Freq: 1
- For WINDOW let : Xmin = 0, Xmax = 100, Xscl = 10, Ymin = -3, Ymax = 10, Yscl = 1.
- GRAPH and TRACE.
- Show Stem and Leaf Plot from the data extracted from the Histogram.

SOL Topic:

AII.19

The student will collect and analyze data to make predictions, write equations, and solve practical problems. Graphing calculators will be used to investigate scatter plots to determine the equation for a curve of best fit.

Activity 5: <u>CLASSROOM VIDEO</u>: The M&M problem showing exponential decay will be explored

Procedure and Student Activity:

- Instructor will place the students into groups of four.
- Distribute one small bag of M&M's and cup.
- Give instructions to students to count the total number of pieces.
- Place in cup. Roll onto table and separate into two groups.
- Count the ones **WITHOUT** "M's" showing.

- Record the data (Two column data...Number of Trials vs. Number of pieces without "M's").
- Place the pieces **WITH** "M's" back in the cup.
- Repeat the roll until none of the pieces are remaining.
- Record data after each trial.

On the calculator:

- Collect the data from each group by recording the sum of each trial and placing in a LIST---remembering that the "MMS" cannot equal zero.
- Show how to "Name" a list ("TRIAL" and "MMS").
- Show how to set up the STAT PLOT, WINDOW, and GRAPH in a "Scatter Plot" mode.
- Discuss the meaning of the scatter plots as they relate to Exponential Decay.
- Find the line of best fit using the "ExpReg" and place equation in "Y_1=".